



COURSE ABBREVIATION	COURSE NAME	NUMBER OF UNITS	PREREQUISITE	YEAR	SEMESTER
CE 412	Fluid Mechanics (Lecture)	3 (3 hrs/week)	MECH 500	2015	1
INSTRUCTOR	RYAN A. RAMIREZ				
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1. Course Description

This course deals with properties of fluids; fluid statics; fluid in motion and the conservation of mass; pressure variation in flows; momentum and energy principles; dimensional analysis and similitude; application in civil engineering: pipe flow, pipe networks, and open channel analysis.

2. Course Objectives

This course aims to 1) identify and obtain values of fluid properties and relationship between them, 2) understand the principles of continuity, momentum, and energy as applied to fluid motions, 3) recognize these principles written in form of mathematical equations, 4) apply these equations to analyze problems by making good assumptions and learn systematic engineering method to solve practical fluid mechanics problems, 5) apply fundamental principles of fluid mechanics for the solution of practical civil engineering problems of water conveyance in pipes, pipe networks, and open channels.

3. Learning Outcomes

Upon completion of this course, students should be able to 1) apply fundamental knowledge of mathematics to modeling and analysis of fluid flow problems in civil and environmental engineering, 2) conduct experiments (in teams) in pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports, 3) understand or become aware of disasters caused by an incorrect analysis in hydraulic engineering system.

4.Texts and References

1) “Fluid Mechanics” by F. M. White, 7th ed., McGraw-Hill, 2) “Fundamentals of Fluid Mechanics” by Munson, Young & Okiishi, 2nd ed., Wiley, 3) “Fluid Mechanics” by Streeter and Wylie, McGraw-Hill, 4) “Fluid Mechanics with Engineering Application” by Daugherty, Franzini and Finnemore, McGraw Hill, 5) “An Introduction to Fluid Mechanics” by Bachelor, Cambridge University Press.

5. Requirements and Student Assessment

1) Attendance (10%), 2) Assignments (10%), 3) Quizzes (20%), 4) Preliminary Examination (30%), 5) Final Examination (30%).

6. Course Web Address

<http://ustce412fluidmechanics.wikispaces.com/>

7. Course Outline

Week	Topics	Assessment
Introduction to Fluids		
1	Background and Definition (Static Fluids and Fluids in Motion)	
1	Units (Dimensions, Base and Derived Units)	
2	Properties (Mass Density, Specific Weight, Specific Gravity, Bulk Modulus, Viscosity)	
Hydrostatics		
3	Introduction (Pressure, Reference Levels)	
3	Pressure in a Fluid (Pascal’s Law, Variation with Depth)	
3	Pressure Measurement (Pressure Head and Manometers)	Assignment 1
4, 5	Fluid Action on Surfaces (Plane and Curved Surfaces, Buoyancy and Stability)	Quiz 1
Hydrodynamics: Basics		
6	General Concepts (Flow Pattern, Visualization, Dimension of Flow, Control Volume)	
6	The Continuity Equation (Mass Conservation)	
6, 7	The Energy Equation	
7	The Momentum Equation (Applications)	Assignment 2
8, 9	Modifications to the Basic Equations (Orifices, Pipelines)	Quiz 2
10	(Student Assessment)	Preliminary Exam
Hydrodynamics: Flow in Pipes		
11	General Concepts (Flow Types)	
11	Laminar Flow	
12	Turbulent Flow	
13	Pipe Friction Factor	Assignment 3
14	Pipe Design (Head Losses, Enlargement and Contraction)	Quiz 3
Hydrodynamics: Flow in Open Channels		
15	Description	
16	Basics of Channel Flow (Friction Formula, Manning’s <i>n</i>)	Assignment 4
17, 18	Varying Flow in Open Channels (Flow Characteristics and Transition)	Quiz 4
19	(Student Assessment)	Final Exam